

## WHAT IS CLAIMED IS:

- 1 1. An acoustic resonator comprising:  
2 a substrate; and  
3 a layer stack integrated to said substrate such that said layer  
4 stack includes a suspended region, said suspended region including:  
5 a piezoelectric body and electrodes positioned to apply an  
6 electrical field to said piezoelectric body, said piezoelectric body and  
7 electrodes having a resonance and a negative temperature coefficient of  
8 frequency; and  
9 a compensator acoustically coupled to said piezoelectric body  
10 and electrodes, said compensator body being formed of a material having  
11 properties by which said compensator at least partially offsets temperature-  
12 induced effects on said resonance, where said temperature-induced effects  
13 are a function of said negative temperature coefficient of frequency.
- 1 2. The acoustic resonator of claim 1 wherein said compensator is a  
2 ferromagnetic layer that is spaced apart from said piezoelectric body by one  
3 of said electrodes, said ferromagnetic layer being associated with a positive  
4 temperature coefficient of frequency.
- 1 3. The acoustic resonator of claim 1 wherein said layer stack includes a  
2 peripheral region that contacts said substrate to support said suspended  
3 region, said compensator being a layer of a nickel-iron alloy.
- 1 4. The acoustic resonator of claim 1 wherein said layer stack further includes  
2 a metallic flashing layer on a side of said compensator opposite to said  
3 electrodes and said piezoelectric body.
- 1 5. The acoustic resonator of claim 1 wherein said layer stack is a thin film  
2 bulk resonator (FBAR) stack.

1 6. The acoustic resonator of claim 1 wherein said compensator is formed of  
2 a material having a positive temperature coefficient of frequency and has a  
3 thickness such that a magnitude of temperature-induced effects on said  
4 resonance by presence of said compensator is similar to a magnitude of said  
5 temperature-induced effects on said resonance as a function of said negative  
6 temperature coefficient of frequency.

1 7. The acoustic resonator of claim 1 wherein said substrate is a silicon  
2 substrate and wherein said electrodes and compensator are metallic layers.

1 8. An acoustic resonator comprising:  
2 a substrate;  
3 an electrode-piezoelectric stack having a target resonant  
4 frequency and having a negative temperature coefficient of frequency; and  
5 a metallic compensator layer having a positive temperature  
6 coefficient of frequency, said metallic compensator layer being acoustically  
7 coupled to said electrode-piezoelectric stack.

1 9. The acoustic resonator of claim 8 wherein said electrode-piezoelectric  
2 stack and said metallic compensator layer combine to define an FBAR.

1 10. The acoustic resonator of claim 9 wherein a major portion of said FBAR  
2 is suspended from contact with said substrate.

1 11. The acoustic resonator of claim 8 wherein said metallic compensator  
2 layer is formed of a nickel-iron alloy.

1 12. The acoustic resonator of claim 11 wherein said nickel-iron alloy is  
2 approximately 35 percent nickel and approximately 65 percent iron.

1 13. The acoustic resonator of claim 8 wherein said metallic compensator  
2 layer has a thickness selected to neutralize influences of temperature  
3 variations on resonance of said electrode-piezoelectric stack such that said  
4 target resonant frequency is substantially maintained.

1 14. A method of fabricating an acoustic resonator comprising the steps of:  
2 providing a substrate; and  
3 forming a membrane on said substrate such that at least a  
4 portion of said membrane is suspended from contact with a substrate,  
5 including:

6 (a) forming an electrode-piezoelectric stack having a  
7 negative temperature coefficient of frequency, and

8 (b) forming a compensator layer adjacent to said  
9 electrode-piezoelectric stack, including selecting a material having a positive  
10 temperature coefficient of frequency.

1 15. The method of claim 14 wherein said step (b) that includes selecting said  
2 material includes selecting a nickel-iron alloy.

1 16. The method of claim 14 wherein said step (b) includes depositing said  
2 material as approximately 35 percent nickel and approximately 65 percent  
3 iron.

1 17. The method of claim 14 wherein said step (b) includes selecting a layer  
2 thickness to substantially match a magnitude of temperature-induced effects  
3 on resonance by operation of said electrode-piezoelectric stack with a  
4 magnitude of temperature-induced effects on said resonance as a  
5 consequence of said compensator layer.

1 18. The method of claim 14 wherein said step of forming said membrane  
2 further includes (c) forming a metallic flashing layer on a side of said  
3 compensator layer opposite to said electrode-piezoelectric stack.

- 1 19. The method of claim 18 further comprising using fabrication alignment
- 2 techniques in said steps (b) and (c) to prevent spurious mode generation
- 3 resulting from partial coverage of said suspended membrane by said
- 4 compensator layer or said flashing layer.

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